SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE CYMMER COLLIERY EXPLOSION.

Sir,—I have no objection to make to the anonymous nature of the attacks in which one or two of your correspondents indulge. There is, on the contrary, an advantage, when the identity is thus masked, in the throwing off of restraint, and the exhibition of latent animus and personal feeling, which enables the intelligence of your readers to make a shrewd guess at the value of the testimony. One correspondent appropriates the name of "Justice," and where he touches suppresses much of the truth, and palpably colours the remainder. In matters relating to my colleague and myself, he is singularly unfortunate. Believing that the author cannot have access to sources of information respecting which he makes the boldest asseverations, I may leave him for the present to the discernment of your readers, who, like "Equity," may have detected the cloven foot under the simulated cloak of "Justice." I will, however, take this opportunity of assuring him that I had no more to do with the loss of his situation than with the drowning of the colliery.

As in the multiplicity of statements, some misapprehension may exist respecting the efforts of the inspection to arrest the lamentable explosion of fire-damp which occurred at the Cymmer Colliery in July last; I think the time has arrived for giving information which has been demanded, as far as I may do so without prejudice.

On July 8, 1852, I sent to the owners of the Cymmer Colliery a letter, referring to the causes of the explosion at the Middle Dyffryn Colliery, where 65 lives were sacrificed, and pointing out that "insufficient ventilation, imperfect stoppings, doors in the main intakes, want of printed rules and strict discipline," might give rise to dangers in the Cymmer Collieries. On March 28, 1854, I inspected the old Cymmer Pit, which had been stopped for about three months. I found no trace of fire-damp in the air. I told the manager's representative and the overman that locked safety-lamps should be used where fire-damp was liable to make its appearance in dangerous quantity—that the air current should be divided into six splits—that most of the main doors should be removed—that the upcast should be enlarged, and that to effect these improvements communication should be opened with the new pit then sinking. I was assured that my recommendations should be attended to, and I further marked on the plan in the colliery office, and made several sketches and memoranda (shown to me not long since), to define how my recommendations should be carried into effect.

I found on Sept. 6, 1854, that my recommendations had not been properly carried out, and I accordingly sent to the owner in the October following 28 regulations for the safety of the workmen, forming as complete a code as can, I believe, be found at the present moment at any colliery. They embodied in the carrying out all my previous suggestions. On Sept. 5, 1855, I inspected the Cymmer new shaft with the underground manager, Mr. Hay, and found that my previous recommendations had been neglected. I went through my memoranda with him, and requested him to take notes of all the defects, with a view to their removal. I told him that the owners were required, by the Act passed three weeks before, to adopt rules of a similar character to those I had already sent to the owners. He expressed himself as desirous of complying with my suggestions, and requested me to furnish him with a copy of the necessary rules, which was accordingly done.

On Sept. 6, 1855, I attended an inquest on an explosion of fire-damp in the Cymmer new pit, and pointed out to the jury, that if my recommendations, sent to the owners in 1854, had been carried out the accident would not have occurred. The jury accordingly returned the following verdict:—"Accidental death, from leaving open the door between the two hard headings; and we trust the proprietors of the colliery will carry out the inspector's suggestions." This Mr. Hay promised to perform.

In December, 1855, before my duties terminated, I suggested numerous amendments to the rules proposed by the owner, in order to render them conformable to my previous recommendations for the safe conduct of the colliery, and I had no reason to suppose that they were not permanently adopted. The other steps which I have taken I should again repeat under similar circumstances, and I am prepared to prove that I have, at least, followed the strict letter of the Inspection Act.

I have confined myself to a mere outline, as an enumeration of the whole of the recommendations I have given would probably fill two pages of your Journal. It is enough to indicate that ample information was afforded of the means of preventing accidents at the Cymmer Collieries, or of mitigating their severity. One fatal accident called attention to the importance of these cautions, which the occurrence of one of the most calamitous colliery accidents on record subsequently proved to have been neglected in the most essential particulars.

Many misstatements have been made respecting my colleague, Mr. T. Evans. Those of your correspondents who have imagined that we were not on the best understanding will attach the more weight to my remark, that I am confident no impartial person, who is fully aware of the duties devolving on Mr. Evans, would pass any reflection on him for not having inspected the Cymmer Colliery. The certain means of preventing most of these fearful explosions, and of rendering the inspection of the collieries sufficiently frequent, I have treated of on other occasions, and will not trespass further on your columns than you have now obligingly permitted.

Clifton, April 14. Herbert Mackworth.

THE LUND HILL COLLIERY EXPLOSION—INQUEST.

Sir,—I approach this melancholy subject with a trembling hand and cautious step, yet I trust with a proper motive—to attempt the elimination, as far as possible, of every tissue of evidence which does not contribute either to the better understanding of the cause of the explosion, or the future safety of working the mine. It does appear to me that a few observations on the part of the evidence now before the public may not be entirely void of interest, nor free from useful application; and I feel confident that if they be dictated, as I hope they will be, by a proper spirit, and a due regard to the feelings and interests of all parties concerned, then I am unable to see in what manner such observations can trespass, even in the slightest degree, upon the sacred duties which devolve upon the jury now deliberating upon the evidence in connection with the most painful calamity which is recorded in the annals of coal mining in this country. Every opinion and statement of a practical character, bearing on a subject which affects life and property, should be carefully considered and judiciously compared, in order that the best and most feasible cause should be assigned to an effect which has, unfortunately, resulted in the sudden death of 189 working colliers. It appears that 23 of the workmen employed in the pit up to the morning of the fatal catastrophe have been examined on the coroner's inquest, and, with two o three exceptions, they concurred with Mr. Coe, the resident viewer, in the statement that the ventilation of the pit was excellent, and, to use the words of Mr. Coe, perfect. This important evidence confirms the opinion which is, I hope, becoming more general, that ventilation, as a remedy to prevent explosions, does not possess that healing virtue to the extent that some intelligent and humane individuals would fain have us believe. The weighty fact of the pure air having to be supplied with a volume eight times as great as that of the proto-carburetted hydrogen, in order to preserve the same purity in the ventilation, is, I fear, entirely lost sight of, or does not receive that consideration from practical miners which its importance demands. It cannot, however, be the object of a sensible man to ignore the question of ventilation, far from it, but to subordinate it to its right position and application. Some of the workmen charged the deputies with negligence in not visiting their work-places daily: the deputies, however, successfully refuted this charge, and it was admitted by all that they might accomplish this part of their important duties in the absence of the men from the boards. One man only, named Abbott, complained of single trap-doors, of which, it appears, there were between 40 and 50 in use in the pit. Now, it is scarcely possible to overestimate the importance of the question of trap-doors in the ventilation of the mine, and the prevention of explosions, especially when there is not a trapper-boy stationed at each of them, and that the hurriers have to open and shut them, in addition to their own duty. I say the fact that one of these doors being left open, the ventilation of some district of the mine will be stopped, and cause it to become fiery, cannot be too strongly impressed upon the minds of the jury. I am glad to see that this evil, the effects of which no amount of care can possibly prevent through all time, is likely to be removed by means of a better system of ventilation. It appears that the brattice, which is used for conveying the air from the bottom to the top of the board or stall, was more than 30 yards, in some cases, from the face of the board, instead of 12 ft., according to the rule. The reason assigned for this infringement of the regulations was the want of a supply of brattice—a statement which is not supported by the evidence of Mr. Coe, the resident viewer.

One of the most important questions, in the opinion of the *Times* correspondent, raised in the enquiry, was the propriety or impropriety of working the pit with naked lights. In the importance of this question, viewed as a means of preventing explosions, I cannot concur; an experience, founded on the individual use of the safety-lamp, unlocked, for many years, suggests to my mind a different conclusion, and one which is confirmed by the intelligence in the *Times* of to-day of two more frightful explosions at Stockport and Swansea. At Stockport, there was a lamp provided for each man, and in spite of this the explosion took place. In a similar case at Swansea, the man took his lamp into a part of the mine where lamps only were used, and the air, being highly charged with inflammable gas, ignited, and an explosion followed. These facts are not influenced by the statement that the men were not careful, but guilty of excessive stupidity and gross negligence. My conviction is that intelligence in the miner himself is the only safeguard, the only effectual remedy, which will diminish the frequency of these national calamities. No man can read the evidence at the inquest of Lund Hill explosion without strongly sympathising with the position in which that event has placed the proprietors. I am aware that the loss of property, and the acute sufferings of harrassing convictions, are as nothing when compared with the sudden loss of a husband, son, or brother; but still even these calamities are by no means inviting, and certainly would not be hailed by any man in his senses; and there are but few that would not admire the Christian-like declaration of Mr. Stewart, one of the proprietors—"We will have nothing which will expose to danger the lives of our workmen." "What we did previous to the explosion we did believing it to be the best." Every collier, as well as the public at large, is bound to accept the spirit, unquestionably good, which dictated this declaration, as an earnest guarantee that in future no means which experience and science united can suggest will be wanting to promote the interests of the colliers at Lund Hill, and secure their safety; but, at the same time, I am compelled to state that it requires no great profunditity of thought to perceive at a glance that such an attainment, however desirable, as that promised by Mr. Stewart can never be realised. Notwithstanding this warm-hearted expression, still all sensible men must know that there are many dangers inseparable from the working of a fiery coal mine. The question is, How are they to be guarded against? and certainly, in my opinion, the response is not by multiplied rules and locked safety-lamps alone, but by the intelligence, I repeat it again, of the men whose duty it is to watch the earliest manifestation of the approach of danger.

The following anecdote will make this plain to the humblest understanding:—An acute tradesman said to his shop-boy, "Take this letter to Mr. B.'s house," at the same time laying down very minutely a great number of regulations and instructions respecting its delivery. The tradesman, however, perceived that the boy was confused with the number of injunctions, and, therefore, wisely called him back, and said, "Now, my boy, instead of giving you so many rules and instructions to remember, I will make you my confidant, and tell you at once the object I want you to accomplish, and leave the means in your own hands, and to your own intelligence. I want that letter which you have to be put by you into the hands of Mr. B. himself; go and do it in the best way you can." The boy executed the mission to the entire satisfaction of his employer, who doubted whether the object would have been executed at all by the means which he first adopted—by laying down rules and minute regulations, which any amount of intelligence, as well as the dullest dolt, might have forgotten. The application of this is easy; the object should not be to teach the colliers obedience to rules and regulations only, like a Russian soldier, but to make them intelligent, by the development of their moral and mental faculties, and thereby enable them to carry out, by their own methods, any objects which may be placed before them. I cannot see any better plan to diminish the number of fatal accidents which are now so familiar in our mining districts. On the whole, I conceive that Mr. Coe's evidence is satisfactory, but still there are one or two points in it which, if substantiated, will lead to more serious consequences than he may now feel disposed to anticipate. The probable cause is stated by him as follows:—"We have a very tender roof above the coal, about six or seven yards thick, which falls in the goaves very freely; above that is a much stronger roof, nearly ten yards thick, which, I presume, will support the weight above it, after the lower roof has fallen for a considerable distance. Immediately above that strong roof are two seams of coals, and a seam of what is generally known as black shale, from 3 to 4 ft. thick. The seams of shale and coal give out gas in considerable quantities. After the bottom roof had fallen down by the extension of the goaf, the stronger roof may have given way, and liberated the gases in the measures above. That being the case, it would necessarily explode on coming in contact with the nearest naked light."

This statement, made by an authority like Mr. Coe, will carry with it considerable weight, and undoubtedly find many supporters amongst the colliers themselves; and if they thoroughly believe that the goaves are likely to be subject to an occasional flood of gas from the measures nearly 20 yards above them, it will not only create and perpetuate unnecessary fears on the part of the workmen, but also be productive of incalculable injury to the interests of the coal proprietors. I rejoice that I cannot participate in these ingenious speculations of Mr. Coe and Mr. Morton, the Government Inspector, as regards the ultimate cause of the explosion. The question, however, of the possible fall of the roof is one that admits of accurate solution, providing the authorities at Lund Hill Colliery can furnish the necessary data, which are—1. The area, figure, and dimensions of the goaf.—2. The tensile and crushing force per square inch of the material.—3. Its density and various thicknesses. From these data a tolerable approximation to the height of a fall of the roof will not be an insufferable difficulty, even by one who has not had the privilege of seeing a goaf. The notice of other points of interest in Mr. Coe's evidence must be deferred to a future opportunity, and I will state, in conclusion, that to attribute an undue influence to any trifling irregularity or deviation from the strict letter of the rules, respecting the position of the brattice and other non-essentials, which could have but little, if any, effect in producing the explosion, will be a great injustice to the proprietors, and at the same time fail to produce the slightest future benefit. Coal Miner.

April 14.

SAFETY-LAMPS.

Sir,—Every person interested in the welfare of the collier must welcome any effort, whatever may be its origin, the object of which is the prevention of those painful calamities which have lately occurred at Lund Hill and other localities. Hence I read the letter, which appeared in your last Journal, from the able pen of Mr. Cook with a great deal of pleasure, as I feel certain that if a number of gifted minds could be brought to the earnest consideration of the all-important question—the miner's safety—some practical good would inevitably follow. In answer to the question, "whether any good use could be made of a lamp so constructed as to give a steady, safe, and brilliant gas light, in the midst of the most inflammable fire-damp?" I have no hesitation in stating my belief that such a lamp, subject, of course, to some modifications which practical men only are able to suggest, may be made available for the purpose of lighting the boards of a mine in safety. I need not say, however, that the application of such a lamp for mining purposes will materially depend upon its expense and external apparatus for the supply of pure air, and for carrying off the products of combustion. Although there are many positions in a coal mine in which a lamp can be used without much inconvenience, still they are not, and I fear they never will be, adapted for the practical use of the hewer and hurrier, or putter. I am now speaking from experience, and a familiar acquaintance with the feelings of this class of colliers in most of the mining districts in the kingdom. Lamps are not the most convenient lights to hole and cut with; and if used for this purpose generally in the Barnsley district, as intimated by the evidence at the inquest, I fear that accidents, instead of being diminished, will be increased.

Colliery viewers and Government Inspectors should weigh the advantages and disadvantages of placing the safety-lamp into the hands of every workman before they recommend such a practice, entirely opposed to the great body of hewers and putters, to the consideration of the coal proprietors. In the second paragraph of his letter, Mr. Cook has endeavoured to explain, to some extent, the mode of applying his lamp. From what I am able to understand, which I confess is very limited, of his description, I am doubtful as to the success of his present plan. I speak it with every proper respect to Mr. Cook that it reminds me forcibly of the Government commission of enquiry into the causes of the fearful explosion at Haswell Colliery some years ago, when the learned *sasants*, Dr. Faraday and Sir H. De la Beche, deliberately recommended that a hole should be bored over the goaf, in order to liberate the inflammable gas, and coax it, as it were, into green fields, by the side of running waters and sunny skies. Sir H. Davy succeeded in reducing the heated air inside the lamp, by a good conductor of heat, below the temperature necessary to ignite the inflammable gas outside of it; it remains now to invent a candle, the flame of which should have temperature below that necessary to ignite proto-carburetted hydrogen. Such an invention would be a desideratum, and would confer a lasting benefit on the coal miner. With these general observations I must conclude, with the hope that Mr. Cook will favour us with a more explicit explanation of his plan, and then I shall be able to express myself more definitely respecting its useful applications. Coal Miner.

N.B.—If anyone should be fortunate enough to succeed in the invention of the candle here indicated, I trust they will not be ungrateful, and forget the individual who first suggested the idea.

THE LUND HILL COLLIERY EXPLOSION.

BEING A THIRD LETTER TO SIR GEORGE GREY, N. WOOD, COLLIERY PROPRIETORS, ETC.

In history we read of no persons more arrogant and presumptuous than the ancient sophists of Greece, who pretended to answer every question, solve every doubt, and explain every difficulty in science. Now, although this absurd vanity was ably exploded by Socrates in his day, and by many in our day, yet we cannot but admit that even in the 19th century much of the old spirit seems to have revived in modern philosophers. Colliery explosions in this country have often revealed to us facts as to the general management of coal mines by engineers and managers which prove that the absurd notions of the ancient sophists are not yet, amid England's scientific achievements, quite extinct.

It will be remembered by the thoughtful and observant that a few years ago a terrible explosion, attended with great loss of life, occurred in a coal mine in Lancashire. In the course of the examination before the coroner and jury, it was there stated by an eminent north country viewer "that the system adopted in this mine (the mine where the explosion had occurred), is that which has been used in Durham and Northumberland from time *immemorial*." Another deposed, "If I had the management, I would not deviate one *iota* from the system laid down." Granted, then, that this class of engineers, or philosophers, have been directly intuitively instructed in the working and ventilation of coal mines, so that science and the experience of ages have not, and never can, teach them anything beyond present attainments in the science of coal mining, does it follow that all other nations, kindreds, and people are to receive as infallible the dictum of this class of extraordinary men, without doubt and without enquiry? I trow not. What then, may we enquire, has been the distinguished success in mines and mining by this *immemorial* system of working and ventilating collieries? The answer is plain and unmistakable; thousands have been burned and choked to death by it, and it is only just now that the Government and people of this country are awakening up to the perilous condition of the mining population, believing, as they now do, that something must be done, and can be done, to prevent a total annihilation of the mining race. I know that in the early days of mining there were difficulties in the way, almost insurmountable with their then scanty knowledge. You cannot wonder at their puny, but best, appliances to ventilate mines and prevent colliery accidents being very defective. Hence a man blowing a large bellows, with a large nozzle, for the purpose of ventilation in the interior of the mine, and when, despite of his blowing, fire-damp accumulated, see him dip his flannel clothes over head in water, then dress himself with them, and proceed to fire the gas by means of tying a string to a purchase, or piece of wood, then retracing his steps to a certain point, and there fixing a burning match to the string, pushed it forward to the point where the gas immediately ignited, but for want of sufficient atmospheric air, and miners being less numerous than now, such explosions could not produce the fearful results as seen from time to time in the mines in this our day. This bellows plan and firing the mines, as aforesaid, have long been replaced by a more efficient plan. With all our modern improvements, however, together with twelve inspectors, whose duty it is to prevent explosions by a vigilant inspection, accidents of a fearful character have been of late years, even up to the present alarmingly increased, which demands a strict enquiry by Her Majesty's Government, to ascertain the reason—for a reason there is and can be given—if a proper class of men be examined upon the subject as to why these sad accidents are not lessened and prevented by the present appliances in operation in our coal mines.

I beg humbly to submit, that if a merchant who employed 12 clerks found on examining his books that he was absolutely doing less business than he did when he had only one, he would know at once that there was something radically wrong in the working of his business, and no doubt he would ascertain the cause, and promptly apply the remedy. Or, to use another simile, if Lord Elgin, Her Majesty's plenipotentiary to China, who is deservedly entrusted with powers to hear and adjust for England and the world's interest, the unfortunate exising difficulties between England and China, should be found in the exercise of his duties in his important mission to aggravate and alarmingly increase these difficulties, under such circumstances the duty of Her Majesty's Government would be plain, and the people of this enlightened country would demand it—viz., Lord Elgin's recall, not for the purpose of his lordship's degradation, but for the purpose of ascertaining whether his lordship had exceeded his instructions, or was competent to discharge the duties of so important a trust as was committed to his care. Apply this rule with regard to the ventilation

of the mines of this country, especially as to their management and mode of inspection, and I fear not the result. I know that it is palmed upon the people of this country until it has almost become a general belief, that these fearful explosions in coal mines are a result that has been and must inevitably follow mining operations. Thank God I live to enter my solemn protest against a conclusion so impious, irrational, monstrous, and indefensible. I affirm and insist that by the law that you pass atmospheric air down one shaft and up the other, even by that law can atmospheric air be conveyed to every part of a coal mine, and that, too, in such quantity and manner that fearful colliery explosions, such as Lund Hill, that in Wales, and other collieries in the neighbourhood of Barnsley and elsewhere, will be rendered by such diffusion or division of the air utterly and absolutely impossible? Allow me to call attention to the important evidence of Mr. Coe, manager of the Lund Hill Colleries, as given on Thursday, April 9. He is reported to have said in reference to the ventilation of Lund Hill Pits—"The original laying out of the ventilation was not in my hands, but I approved of it." That is, in plain language, rendered intelligible to a non-mining population, Mr. Coe approved of the return air charged with fire-damp (highly inflammable gas) being directed, as it was, to go over a burning fire. He now says—"I think now, with the sad experience of this explosion, that if any other efficient means of ventilation could be applied I should prefer it." The Government Inspector, Mr. Morton, asked—"Do you consider this mode (the return air going over the fire) of ventilating the pit a safe and judicious one?" Mr. Coe replied—"Before the explosion, I thought the Lund Hill Colliery was ventilated in the best manner possible. The mode I should now wish to apply would be different from the present one." Mr. Morton: In what respect would your mode of ventilation differ? Mr. Coe: "In all the Barnsley collieries subject to an influx of gas I should feed the furnace with fresh air, and would not allow the return air to pass over it (that is the fire), but carry the return air through a dumb drift, for the obvious reason that the return air might explode at the ventilating furnace." In answer to a question put to him by Mr. Steward, one of the proprietors of the Lund Hill Mines, on the Tuesday before the fearful explosion on the pit hill, in reference to the ventilation, he (Mr. Coe) replied—"It is perfect; I know the system of ventilation perfectly."

After Mr. Coe's extraordinary admission and confession in reference to Lund Hill's workings and ventilation, and that of other collieries in Barnsley district, the intelligent people of this nation will become excited and alarmed for the safety of the miners of that neighbourhood. While I would honour Mr. Coe for his honest admission and confession, I would earnestly implore, in the name of God and humanity, all colliery owners, engineers, and managers of collieries, at once and for ever to annihilate the system of working and ventilating collieries, so terrible in its results to masters and men.

I will now once more reiterate (would to God I had a voice like a trumpet, to be heard in every mining district, and by every colliery owner and manager) what I have urged before the public, Secretaries of State, Parliamentary Committees of Lords and Commons in 1834, 23 years ago, that the system of ventilating coal mines, such as that at Lund Hill, and others in that locality, is not only awfully destructive in its effects, but it, I maintain, is a disgrace to any mining engineer in any civilised country to recommend or adopt it.

I beg here to warn Mr. Coe and other colliery managers of only having two currents of air for the purpose of ventilation in an extensive mine like Lund Hill. Yes, though the furnace evil may be rectified, I am frank to confess that in the event of an explosion in a fiery mine, where there are only two divisions of the air, I can see very little, or indeed no, hope of any of the poor men in one division, and distant from the bottom, ever getting out alive. I very readily and cheerfully assign a reason for arriving at this conclusion. When an explosion takes place in a coal mine, carbonic acid or choke-damp is the result, formed as it is by combustion; and as this fact indicates an equal volume of oxygen removed, such an atmosphere, *ceteris paribus*, more destructive than another, where the air and gas are in simple admixture. This all-destructive gas is immediately diffused through the mine. Poor fellows! how can they live in such an atmosphere? They know it, and immediately place their caps or jackets to their mouths to prevent death; but breathe them they must, and to breathe is to die, for they become as a consequence almost immediately asphyxiated as effectually as if they were submerged in water, or placed under an exhausted receiver.

It is generally admitted by physiologists that an atmosphere containing more than one-tenth of its volume of carbonic acid will, if introduced into the lungs, speedily prove fatal to human life. What, then, must be the awful and rapidly fatal effects of carbonic acid in a coal mine immediately after an explosion? If, however, there are several divisions of the air to ventilate, instead of one or two, this destroying gas would not, and could not, have the murderous effect as at present seen after an explosion in the mines of this county. Because and for this reason: This gas in that case would be confined, as it ought to be, and as it can be made to be, to that part of the mine alone where such division of air was employed to ventilate. See then the paramount value of separate winds, or currents of air, in a coal mine. I hope and believe Sir G. Grey will see it his duty to aid and protect the unfortunate coal miners of this country, by putting a stop to all coal mines until remedied, where the lives of the miners are in constant eminent jeopardy through defective, unscientific systems of ventilation, and which every now and then results in such fearful sacrifice of life and property.

Having been for several years a practical miner in a fiery coal mine, graduating therein as I did from a trap-door boy to a hewer of coal—having had a much-loved brother dashed to pieces by a preventable accident in a northern coal mine—believing as I do that fearful colliery explosions are easily preventable by ordinary inexpensive common-sense appliances. Such views and experience are my apology for intruding upon Sir George's time and attention.

T. STEPHENSON.

Rothwell, Leeds, April 12.

LUND HILL COLLIERY EXPLOSION.

SIR,—The late deplorable event at Lund Hill, by which 190 human lives have been sacrificed, under circumstances the most appalling to our nature, and that which is most to be deplored in this case, and which distinguishes this explosion from all its predecessors, in my humble opinion, is the fact of closing the shaft, thereby preventing the efforts of humane and heroic men from being put forth to rescue the suffers. This event calls for the most patient and impartial investigation, to ascertain, if possible, the true cause of the catastrophe, for if, as many are led to believe, and as many more declare, these events cannot be prevented, while others attribute them to an inscrutable and unerring Providence, then we must patiently submit; but is it not more reasonable to suppose they are the effects of a cause, and that a known one, and that every fearful explosion of carburetted hydrogen gas in mines, by which life is sacrificed, wives are made widows and children orphans, the feelings of the public harrowed and the property of capitalists destroyed, and while all are made to suffer in the immediate locality, townships, tradesmen, and others, only tend to deepen the conviction that something must be done more than has been done to prevent these fearful calamities. Much has been done already by science, the Legislature, the Press, and by those more immediately connected with mining operations, but in spite of all that has hitherto been effected, the evil, instead of being lessened, is aggravated, and the loss of life increases. The Davy, or safety-lamp, was a contribution that was hailed with delight, and is still confided in to an amazing extent, but what is the fact? Since the invention and application of this important article, on the most improved principles, the sacrifice of life has increased to an alarming extent. Something more remains to be done, or we shall be compelled to close our deep mines, and hermetically seal in the bowels of the earth our most valuable minerals, strike a fatal blow at our steam navigation, our railways, and manufactories, and lose our *prestige* as a nation, for no one will for a moment suppose that men will be found to risk their lives in such imminent dangers, and to be liable at any moment to be destroyed by hundreds, and left to perish in fire and smoke, and their remains to be left for an indefinite period, or, perhaps, never to be found. I fear we have only in the past been grappling with the details, leaving the principles untouched; and here, again, we have a great difficulty to overcome. No two mining engineers, managers of collieries, or proprietors, are agreed as to the requirements of mines, and the quantity of air that is necessary for the health and safety of those employed. Yet, on this point the whole question hinges. The simple cause of an explosion is want of atmospheric air sufficient either to remove the gas or dilute it below the explosive point; but instead of solving this important point, the attention of juries, after an explosion, has been directed to minor matters. The questions generally propounded are, Has there been a door left open? a lamp top taken off? a reckless collier lighting his pipe? or has there been a fall of the roof? Now, as to the first point, a door being left open, it is a strange arrangement in ventilation where the leaving open of a trap-door endangers the lives of hundreds of persons; but it is simply impossible. Then, as to taking a lamp top off; I would ask, is that mine in a healthy state, or a fit place for human beings, or even brutes, where the quantity of gas is so large as to render it impracticable to take off a lamp top? The same may be said in reference to lighting tobacco in pipes; it is simply absurd. Then, as to falls of roof. Now, it is a well-known fact to all who have had any experience in mining operations, that there is no such thing as sudden falls of roof in large quantities; falls are a gradual work, and give timely warning to those experienced, if they would act upon the admonitions; but suppose them to be sudden and extensive, then the question to settle is, is it a well ventilated mine, where the lives of the man employed, and the property of the employers, is endangered by falls in the roof, which are as natural as the getting of the coal and undermining it. If no remedy can be found, then the only alternative will be to close the mines, as we have before stated, or to pay for labour at an enormous price, and indemnify the employed and their wives and families in case of accidents. But there is a never failing remedy; supply atmospheric air and properly distribute it to every part of the workings of the mine, then there will be no explosion or danger of one. In order to do this, it will be necessary to lay aside the fatal prejudice against large shafts; if colliery proprietors will have small shafts, let them be compelled to have a number of men in proportion to the size of the shafts for ventilating purposes. Many eminent men are agreed that 300 cubic feet of air ought to be supplied to all men, boys, and horses employed in mines, and the system of ventilation such that the said 300 cubic feet of air shall be conveyed to where the men are at work. Now, for a mine where there are 220 men and horses employed, the quantity of air ought to be 66,000 ft.; but how can 66,000 ft. be sent through an area of 50 ft. at the most, or, may be, only 39 ft. To get the above quantity of air through an area of 50 ft., would require the air to travel at the rate of 1320 ft., or 440 ft. per minute, or 15 miles per hour through the workings. Now, let any impartial party look at this state of things, and then say to what explosions are to be attributed. Clearly, to a want of atmospheric air in the mine; but it may be asked, is it possible to obtain a supply of 300 ft. per minute for each and all employed. I answer, It is, and without any considerably increased outlay. The difference of outlay in sinking shafts between 9 and 12 ft. for 300 yards deep would not be more than 600*l.*, and the area would be nearly doubled, or as 63 is to 113. Now, an area of shaft 12 ft. would allow a current of air (if free from obstructions) of 113 ft., and travelling at the rate of 600 ft. per minute up the upcast shaft would give 67,800 ft. per minute; but would it be practicable or wise to send air through the workings at the above-named velocity? I answer, No. Would it be necessary? The difference would be between making four or more equal divisions of the air at the bottom of the downcast shaft, and conducting the same through the workings of the mine in the said divisions, and it is quite as practicable as having two divisions and keeping the currents or divisions distinct all through the mine; and let them have a separate entrance, with the full area of 40 ft. for each, in the workings into the upcast shaft, as well as from the downcast shaft, as there can be no greater mistake made in ventilation than to make a division of the air in the interior of the mine. But the existing evil that even sensible men cling to with a tenacity worthy of a better cause, is the absurdity (adopted almost universally) of the upcast shaft being smaller than the downcast. I never heard a substantial reason adduced in support of this theory, nor, in fact, any reason at all, only the anomaly of sending the air quicker up the upcast shaft than it was passed down the downcast, and with a large upcast shaft this would be required. I am no philosopher, but I am of opinion if the air was displaced by means of furnace jet, fan, or whatever creative power else, when the vacuum is created it will rush in as fast as it is taken out, and no faster; the downcast shaft will be kept full then, as the furnace is the most certain, economical, safe, and efficient ventilation. What are the results of its action, but to heat the air coming in contact with its influence? The heated air becomes rarified, and expands on the same principle as steam in a boiler, and in the nature of things, according to my common sense, it requires as large a space for egress, when expanded, as for ingress, when compressed.

If this be correct, then the upcast shaft ought in all cases to be the larger of the two, but what is the prevailing practice? An upcast shaft of small dimensions; a downcast shaft with innumerable obstructions; airways of limited area; a principle of working the mines, and conducting the ventilation, that if any obstruction take place in one part of an extensive mine, the air is cut off from all employed, and miles of workings, with scores of workmen left exposed to the fearful calamities with which miners are so familiar.

Having said so much on the subject of air to be supplied, and the mode of distribution, the furnace, on which all depends, claims our attention—First, as to the most proper place in the mine for its construction; and all who have known anything of the danger arising from returned air passing over the furnace, or being allowed to come in contact with the fire at all, advocate their being removed from the vicinity of the shafts to a distance, where no danger need be apprehended, even should an explosion take place. The safest part of a mine for the furnace, in my opinion, is the dip side of the shaft, at a distance of from 70 to 100 yards; there they would be clear of all workings, and, if allowed as much as would supply combustion only, and fresh from the downcast shaft, there would be no danger of the overcharged return air igniting when passing over the furnace, nor of setting the coal on fire, and causing the shafts to be closed, in case of an explosion, at so fearful a cost to the proprietors, and so great pain to the survivors of the unfortunate beings whose lives are sacrificed; these sad disasters could not in the nature of things follow. But what positive evils attend furnaces when so constructed that the air, when returned from all the workings, having traversed a journey of many miles, brought the gas from every part of the mine, and then contracted it into a focus of, say, 50 feet area, taken over a fire, laid on a grate of 12 feet by 8? there is but one result to anticipate. Talk of using safety-lamps, what a farce to suppose that, in the integral parts, or proportion of 1 to 220, there is danger of an explosion, and no danger when the congregated mass has done its work, to be returned over this monster fire; either ventilate with a huge safety-lamp (which is impossible), or else, in the name of all that we hold dear, remedy this evil, and convey the return air out of all mines, without taking it over or near the furnace. Again, we hear so much said about bratticing, "what a delusion." Every one who has had any experience in mining operations, knows that bratticing is only to keep one man's working free from gas; and in a mine well ventilated, only one life would be endangered by the neglect of brattieing in each working place where they were required; the gas, if ignited, could not pass from one part to another, therefore, from want of brattieing, there could not be an explosion of any moment.

We would also call attention to the nature of the duties of fire-triers, or deputies. What means have they of ascertaining the state of the mine? They have the safety-lamp, but that only tells them when there is sufficient gas to explode at a naked light; hence the workings of a mine may be in the most dangerous state, and yet the presence of the enemy not be detected; therefore deputies, or firemen, are not to be accounted less wise, or less careful than they ought to be, when they are not able to discover in what proportions the atmosphere of the mine may be combined. But what does the inspection, under the auspices of Government, tend towards effecting the desideratum contemplated by the Act of Parliament? Accidents, by means of this agency, should be prevented; but they are on the increase, and each succeeding one more fearful than its predecessor; and this evil will increase until we pass from the minutiæ and details of a bad system, to base our operations on sound principles, when we obtain an intelligent sense of the requirements of mines, cease to blame reckless colliers, want of brattice boards, or safety-lamps, incompetent or careless firemen or deputies—these are stereotyped excuses, and have done more to perpetuate the evils complained of than any other existing thing besides. We want a remedy, it is at hand. Make the shafts large enough; make proper divisions of the air; supply it to every part of the mine; give 300 feet of air to each person employed, and let them have it; leave apertures for the escape of gas from the gooves; let the furnaces be properly constructed; keep good order, enforce discipline, educate the rising generation. Make inspection what it ought to be, an aid in the great work, instead of an impediment. Let men be appointed who will inspect the mines before explosions, not after; men well skilled in mining operations from long practice, and who know their duties, and well perform them, and who are not afraid to go into every part of a mine. Let each inspector have as many collieries as he can inspect, and no more; let him, also, have his deputy, or sub-inspector, to go at any time into every part of the workings, then the evil will be abated—every man will be responsible for his own safety; but do not let the lives of hundreds be jeopardised by the carelessness of one reckless being, or from any accident that can occur. Let us cease to complain of the cupidity of colliery proprietors—they are misled generally; many of them are ignorant of the requirements of the works they establish. They employ what they suppose to be competent men; but false economy, ignorance, and prejudice, are at the root of all the evils that exist. Sometimes, we are told, working coal too fast is the cause of an explosion; this is simply ridiculous, without qualification. If the standard for ventilation is permanently fixed when large collieries are opened, I grant in that case coal may be got too fast; but if the ventilation be always proportioned to the number of men employed, how can a mine be worked too fast? This theory offers a premium to consummate negligence. If the gas is allowed to accumulate during the working hours, then it follows that respite or suspension of the works is necessary to clear away the accumulated gas. Then how long are the works to be in operation between such respite or suspension?—an hour, a day, or a week? For if there is danger from working, may it not be as great in an hour as a week? The best plan is, "keep it always clear," and then there will only be the unavoidable contingencies to fear; as, under the best system, there will always be accidents. But I am fully persuaded, and have been for years, that explosions so destructive to life and property can be avoided. I do not blame any of the parties connected with Lund Hill for any intentional neglect,—the past is past; but are there not many more collieries in this district, and in the United Kingdom, where the slightest mishap would lead to results quite as disastrous, or even more so, than at Lund Hill?

Let us hope the warning will be received, and every necessary precaution adopted that will ensure the safety of mines and the property of proprietors, and that the public will be spared the painful excitement these distressing events cause for the future.

ONE WHO HAS BEEN PARTICULARLY CONNECTED WITH MINING OPERATIONS FOR 33 YEARS.

LUND HILL COLLIERY EXPLOSION.

SIR,—While sympathising with Mr. Thos. Cook, F.R.S. (whose letter appeared in your last Journal), in his laudable efforts to lessen the dangers of miners, I cannot but think, from the little knowledge I possess of coal mining, of the utter impracticability of introducing the lamp which he proposes into the workings of coal mines. His principle of ventilation, so far as I can see, is that carried out in all the Marquis of Londonderry's mines in the county of Durham, and it would be well if some of our mining reformers were to pay a visit to the Stewart Collieries, and judge for themselves how far careful management and good ventilation have tended to reduce the number of these dreadful accidents—a fact which proves itself from there having been no accident of this sort since 1817 on the Stewart estate. As to lighting the mines with gas, like the streets of a city, your correspondent may be very well acquainted with the surface, but quite unaware of the difficulties of such an undertaking underground. The introduction of gas into the working "stalls," "boards," or "headways" of a coal mine would be highly dangerous, and lead to an increase of those dreadful explosions which have latterly been so frequent.

April 14. ONE WHO HAS WORKED IN THE MINES.

THE CYMMER COLLIERY EXPLOSION.

SIR,—I promised, in a former communication, to review the trial of the men indicted for manslaughter in the Cymmer Colliery case, and I now hasten to do so.

Baron Watson, the presiding judge, had made up his mind on the subject before he came into Court, and hence, in his direction to the grand jury, he more than intimated that there was no case against the prisoners. That grand jury, composed of some of the most intelligent gentlemen in this district, were not the men to pander to the dictum even of a judge, hence they found a true bill against Jabez Thomas, Rowland Rowsand, and Morgan Rowland.

The next part of the drama was the trial of these three men. It was observed by all in Court that the judge was impatient, restless, peevish, and evidently out of temper. He did not care to conceal that he was a zealous advocate of the prisoners at the bar, and that he was trying a cause which, in his opinion, ought never to have come into Court. The prisoners of course pleaded not guilty.

Both at the coroner's inquest and at the trial Mr. Insole, the proprietor of the Cymmer Colliery, figured in bold relief as a witness. At the inquest, as the owner of the colliery, he may be said to have been placed on his trial, for the part which he had played in a drama, which closed with the slaughter of 114 human beings. On his oath he there deposed, that "he considered Mr. Jabez Thomas the responsible manager;" that he (Thomas) "was intrusted with the entire control;" and that to him (Mr. Insole) "it was a satisfaction to know that he never curtailed any expenditure that might be suggested to him as conducing to the safety of the workmen;" and that he (Mr. Insole) "considered Jabez Thomas to be one of the most competent mining engineers in this district." Dealing with this evidence, it was clear that the coroner's jury had nothing more to say to the proprietor of the colliery. The whole responsibility was thrown on Jabez Thomas, and against him a verdict of manslaughter was pronounced—Mr. Insole walking away from the coroner's court a free man. But the curtain again rises, and the scene is entirely changed; Jabez Thomas and Co. are now arraigned at the bar of justice. Mr. Insole's personal liberty is no longer at stake. He has thrown the entire responsibility on his manager, and we find him once more in the witness box; but in this case coming to the rescue of Jabez Thomas. At the inquest, Mr. Insole vindicated himself, because the manager placed in charge of his works was one of the most competent mining engineers in this district. At the assizes, this same Mr. Insole deposes on oath that "Jabez Thomas was not a person skilled as an underground man or engineer." The report of Mr. Insole's evidence at the inquest will be found in the *Swansea Herald* of July 30, 1856; and the report of his evidence at the assizes will be found in the same Journal of March 4, 1857.

By the first special rule of the Cymmer Colliery, the responsible charge and direction of the mine and workmen was vested in the manager (Jabez Thomas). It was his duty to provide proper machinery, &c., and to test its adequacy. He was required to lay out the ventilation of the mine, and to make provision for the removal of noxious gases. He was called upon to distinguish where naked lights were to be used, or when the safety-lamp became necessary; also, where blasting might be allowed.

Strange to say, that a colliery manager of 26 years' standing in the same employ, had the hardihood to put in a plea of ignorance of the duties he had undertaken, when placed on his trial for the neglect of those duties; but far more strange to hear an English judge vindicating the prisoners at the bar on account of their ignorance.

Mr. Justice Maule laid down the law to the effect "that if any neglect or omission of a plain and ordinary duty, which resulted in the death of an individual, were proved against an accused person, and even if this neglect or omission were shared in by other persons, he would be equally guilty of manslaughter as if the neglect had been his."

Mr. Baron Watson, in summing up the evidence, observed that, "in this mine was what was called fire-damp; yet, notwithstanding this, candles were used by the colliers instead of the Davy lamp." This being so, according to Baron Watson's own admission, surely the case of a plain and ordinary omission of duty was clearly made out. Witnesses (colliers and others) had described the unmistakable evidences of the presence of gas, in almost explosive quantities, for months before this fearful occurrence. Complaints had been made to the overmen and to the manager on the subject; the air was said to be loaded with impurities; the cap was spoken to as being continually visible on the candle, and yet men were daily sent down by hundreds into this polluted atmosphere, and that too without the ordinary protection of a Davy lamp. But Mr. Baron Watson told the jury that they "must remember they could not get such geniuses as Mr. Evans and Mr. Bedlington as overmen; the knowledge those men had did not belong to other men." Now, Mr. Jabez Thomas and Mr. Bedlington, so far as their position in life is concerned, happen to be on the same footing, both being colliery managers. Surely, Jabez Thomas, the colliery manager of 26 years' standing, though not a "genius," ought to have known, and undoubtedly must have known, that to have consigned hundreds of men daily into a region of fire-damp was a most cruel and reckless neglect of one of the duties he had taken upon himself to perform, and in direct violation of the first general rule for the guidance of collieries, under the Act of the 18th and 19th of Vict., sect. 4.

According to the law as laid down by Baron Watson, no man can be held to be guilty of any offence unless he be a "genius." If a man be charged with poisoning, unless he be held to be such a "genius" in chemistry as a "Herapath" or a "Grove," his ignorance is a sufficient vindication. If he be accused of an offence against the common law, such a charge cannot be sustained, unless the party indicted be proved to be such a "genius" as Baron Watson himself. Surely, "if ignorance (of the law) is bliss 'tis folly to be wise."

What is the effect of Baron Watson's ruling, so far as the safety of the working collier is concerned? All protection is removed from him! The appointment of Government Inspectors is the perpetration of a farce! The 18th and 19th of Vict., sect. 4, is a solemn mockery, a gross delusion, and a cunningly devised snare! Only let colliery proprietors take care to select for their managers men as grossly ignorant of their duties as the veritable Jabez Thomas and his deputies, and they may then drive a coach and six through Acts of Parliament, and over the necks of Government Inspectors. The working collier is further off from protection now than he ever was, since, by Baron Watson's ruling, all protective enactments are completely stultified. Might has triumphed over right—the majesty of the law has been brought into contempt—the confidence of the working collier, in the protection which it affords, has been driven to the winds by the breath of one of the judges of the land, and we are thrown back again on the tender mercies, or rather the avariciousness of colliery proprietors. Surely, human life is a cheap commodity within these realms.

JUSTICE.

EDUCATION OF COLLIERS.

SIR,—You are ever ready to lend a helping hand to the poor collier, especially as regards the improvement and extension of his opportunities for acquiring knowledge; and surely there is no other class of operatives more in need of your assistance in this, as well as in other respects. Will education lessen in any degree the present fearful amount of accidents in collieries? I am quite in the same persuasion with "Coal Miner" regarding this matter. The working colliers, as well as the managing colliers, ought to have the opportunity of listening to weekly or fortnightly lectures on scientific subjects, and seeing actual experiments made with the death-bearing gases, to the operations of which so many of them are ever and anon becoming victims. We are emphatically creatures of sense, and one can easily conceive how a man, through gross ignorance, gives a kind of half-credence to what he has heard of the marvellous properties of fire-damp, whilst he has never seen these properties exhibited; but let them but once become familiar to him from lecture table-experiments, he will then have a continual careful apprehension of the presence of his mortal enemy, as the blazing hydrogen or poisonous carbonic will ever then be before his mind as a kind of dreadful reality.

The colliers, generally speaking, are not a careless set of men: with them, as with many others, there is only a want of care where there is a want of knowledge. That army of brave soldiers would not have marched over the subterraneous mass of hidden gunpowder had they known of its lodgment there: neither would the daring collier unscrew his lamp or burn his candle in the immediate neighbourhood of fire-damp, were he aware of its presence and actual power. How praiseworthy the efforts and how encouraging the success of the British Government in promoting an efficient popular education, whereby the masses may learn to read, write, and do arithmetic, and acquire some inkling of grammar, geography, and history—this, of course very properly, to give them a degree of fitness for the duties of this life, and a kind of moral qualification for the society of their fellow creatures; but is it not equal, if not greater, in degree of national importance, that a special effort of Government be made to give our coal miners not only the above education, but one especially adapted to the requirements of their occupation—one that shall be to them as a shield in peril, eyesight in darkness, and a key to mineral treasures?

It is indeed high time for indefatigable activity and firm perseverance in the collier's cause—a cause in which a great deal of thought, of time, and of money, have been expended; yet, nevertheless, we are loudly and piteously called upon by feelings of humanity, as well as by individual and national interest, to continue this expenditure. Miners' advocates, do you grow weary? What painful assurances we have of the untiring operations of destructive gas explosions!—these never grow weary. Again the columns of our public journals must wear the melancholy—yet, strange to say, accustomed—expressions, colliery explosions, and this, I unhesitatingly affirm, to the reproach of science and legislation.—*Bristol, April 14.*

M. PEVAR.

CONTINENTAL MINERS' AID SOCIETIES.

We have already referred to the BENEFIT SOCIETIES FOR WORKING MINERS IN GERMANY AND BELGIUM, and return to the subject to explain more fully the constitution of these excellent institutions. The occupation of the miner is attended by circumstances entirely peculiar to itself; their health, and even their life, is constantly in danger, and the exploration of subterranean deposits necessitates the continual intercourse of a large number of men permanently engaged in the same description of toil. It can scarcely be wondered that such a combination of dangers and interests should long since have caused the establishment of societies, or mutual associations, in the country which gave birth to mining, and in which the spirit of union has ever been so prominent. Societies for assisting those who had met with accidents in mining operations were established in the Hartz at the beginning of the 16th century, by virtue of decrees made in 1524 and 1528; and about the same period an edict of the GRAND DUKE OF TREVES prescribed the deduction of a portion of the miners' wages for forming a similar undertaking. As at present constituted, the German "Miners' Aid Societies" are not only ordinary financial establishments, created for assisting the miners and their families, but are truly mutual associations, in which are found all the features of the national character, natural talent, respect of the hierarchy even to the lowest classes, faith in local traditions, love of frugality, and the just appreciation of the benefits of elementary instruction.

As might be supposed, from the institutions having been so long known to the country, they are not established upon a uniform plan: some are independent both of State and private assistance; some have recourse to private contributions; and others, indeed the greater part, are supported by the Government; which, whilst it imposes certain conditions and rules, has also guaranteed immunities and privileges, and placed them in a position to render greater service. The statutes of these mutual societies ordinarily contain three parts—the general duties of working miners; their special duties as members of the association; and an enumeration of the benefits which are guaranteed to its members. The first section of these statutes requires no comment, and we, therefore, pass on to the second. The conditions upon which miners are admitted are these:—The candidate must prove that he is of the proper age for admission (usually between 16 and 40); he must be in good health, and possess a constitution sufficiently strong for the work (the society's doctor is consulted on this point); the doctor must ascertain that the candidate has no redhibitory vices, augurring premature incapacity or death; for chronic maladies the testimony of fellow-workmen is usually taken; and, lastly, the candidate must prove that he has regularly worked in the mine for a certain time.

Workmen not permanently engaged in the mine are differently dealt with; sometimes they have no connection whatever with the association, and sometimes they are included in a separate class, enjoying only a portion of the benefits which the association offers. It frequently happens that there are labourers who, although not permanently engaged in the mine, are nearly so, but are too young or too old to form part of the society, properly so called; these form another special class. Again, there is often a third class, which includes the workmen whose employment is quite irregular. The sons of members are always admitted by preference. The administration of the society is conducted by the Government agents gratuitously; and, further, a part of the management is placed in the hands of certain members, who are called *anciens*, and who are elected at stated periods by their fellow members; unexceptionable morality, experience in mining, a sufficient amount of instruction, and, usually, a certain age, are the qualifications for this important post. The *anciens* have general surveillance over all the members (especially with regard to feigned sickness); they take care that the members are properly visited by the doctor; they distribute all benefits, unless it be otherwise specially provided by the statutes; they observe what change might be advantageously made in the regulations, and in the several rates of benefits; and have to make known to the proprietors of mines the wants and views of the workmen. The *anciens* sometimes receive a small remuneration.

The income of these institutions is derived from interest on the accumulated capital, voluntary contributions and donations, and from fines inflicted upon the members for infringement of regulations, but principally from the contributions of the members and of the mine proprietors. The members' contributions are of two kinds, fees payable once, and current contributions; the first consist of entrance fees, fees payable at marriage, and upon promotion in the mine; the current payments are so much in the pound earned; the pay clerk stops it from the wages on the day of payment, and hands it into the society monthly. As a general rule, no money is returned to members upon their withdrawal or expulsion from the society. The ordinary amount payable by the members varies from 2 to 5 per cent. upon the wages; in the Royal Mines of Eschweiler, 1 per cent. only is paid. Another contribution made by the miner consists of certain quantities of ore which they break in some mines at regular intervals, and gratuitously; this ore is, by agreement with the proprietor, extracted for the joint profit of the benefit society and the local schools.

The contributions of the mine adventurers are of a very varied character; in many mines it consists of a percentage upon the gross profits; in others in a proportion of the receipts, and often in a fixed amount. It is also common, and especially in the mines in which the State is called

upon for support, for them to pay the difference between expenditure and receipts, when the former exceeds the latter. The benefits which well organised societies upon this principle offer are—in case of illness, medicine, and advice gratis, for the members, and sometimes for their family. The doctor in all populous districts is regularly appointed; and in societies where the resources are considerable, they have also a dispensary, which supplies medicine at a reduction of 25 per cent. upon current prices. The necessaries of invalid miners are provided by the society, many of which have their private hospital. During illness the miner receives, in lieu of salary, an allowance, unless the illness has been wilfully caused. A rigorous watch is kept over the invalids. When the malady, or accident, incapacitates the miner for further labour, he receives a pension for life. The society contributes to the funeral expenses of active and invalid members, and sometimes to those of their family. The widows receive a pension for life, or until they marry again. The society gives protection and instruction to the children of the invalids and widows until they are old enough to earn their living. To which must be added accessory benefits, comprising special aid to members in exceptional circumstances, gratuitous education of children, purchase of schoolbooks, &c. The rate of aid, and especially of pension, is regulated by the rank which the miner has occupied; and it is also considered whether the recipient is incapable of further labour, or whether he may be useful in secondary occupations; and, as a general rule, the societies assist "tramps," to the extent of from 5 to 10 gr. (6d. to 1s.).

En résumé, that which characterises the German associations, is their combining the features of benefit and annuity societies, by which the best possible effect is produced; but it will be readily believed that it is of vital importance that the administration should be trustworthy and intelligent, from the fact that a large amount of the revenue is placed at their disposal. In consideration of this, the appointment of *anciens* cannot be too highly commended; and it is not without reason looked upon by the miners as their greatest security. The Belgian law of 1854 provides for the establishment of nearly similar institutions in Belgium, and gives the members many privileges, and amongst them "exemption from stamp duty and registration for acts passed in favour of these societies, and the delivery, gratuitously and exempt from duty, of all certificates, notarial, and other acts, the production of which is for the benefit of these societies." This law refers only to those engaged in mining, and it has been found to answer excellently; we may, therefore, conclude that it is well worthy of the attention of English miners, and that it should be ascertained how far the principle may be adopted in England.

GEOLOGY—PRIVATE LECTURES ON THE EARTH—No. IV.

PRODUCTIONS OF THE PRESENT, AND RELICS OF THE PAST.

With this short sketch of the order and character of the entombed organic remains in our rocks, we shall now proceed to show what impressions they have produced in the minds of scientific men. Sir C. Lyell, in his *Principles of Geology*, observes, that "The fossils of the Devonian and Silurian strata in Europe and North America have led to the conclusion that they were formed for the most part in deep seas, far from land. In those older strata land plants are almost as rare as they are abundant or universal in the coal measures. Those ancient deposits, therefore, may be supposed to have belonged to an epoch when dry land had only just begun to be upraised from the deep," &c. These observations of Sir C. Lyell perfectly coincide with what we have already remarked—namely, that the deposits of the Silurian rocks present similar aspects to those now forming in or near the antarctic region, where the dry land is barren of vegetation, and appears as though it had recently emerged from the ocean.

In reference to the next group, the same author remarks:—"It is only in the islands of the tropical oceans, and of the southern temperate zone, such as Norfolk Island, Otaheite, the Sandwich Islands, Tristan d'Acunha, and New Zealand, that we find any near approach to that remarkable preponderance of ferns, which is characteristic of the carboniferous flora. * * * Palms, if not entirely wanting when the strata of the carboniferous group were deposited, appear to have been exceedingly rare. The coniferæ, on the other hand, so abundantly met with in coal, resemble araucariæ in structure, a family of the fir tribe characteristic at present of the milder regions of the southern hemisphere, such as Chili, Brazil, New Holland, and Norfolk Island."

Professor Ansted likewise observes:—"Ferns are extremely abundant, and remarkably similar to many now living. * * * This prevalence of a peculiar kind of vegetation is very marked, and indicates climatal peculiarities resembling those of the islands in the Southern Ocean, where a preponderance of similar plants is known to exist." Again: "It appears very probable that the climate of the northern temperate zone (or as we should say, of the carboniferous strata) during the epoch in which the coal measures were formed, may have been similar to that now existing in Chilæ, and the adjacent part of South America."* These remarks are also in strict accordance with what we have stated, that the deposits were formed in the south temperate zone.

Of the secondary rocks, Sir C. Lyell writes:—"If we examine the rocks from the chalk to the new red sandstone inclusive, we find many distinct assemblages of fossils entombed in them, all of unknown species, and many of them referable to *genera* and *families* now most abundant between the *tropics*. Among the most remarkable are reptiles of gigantic size; some of them herbivorous, others carnivorous, and far exceeding in size any now known, even in the torrid zone. The genera are for the most part extinct, but some of them, as the crocodile and monitor, have still representatives in warmer parts of the earth. Coral reefs also were evidently numerous in the seas of the same periods, composed of species often belonging to genera, now characteristic of a tropical climate. The number of large chambered shells also, including the nautilus, leads us to infer an elevated temperature; and the associated fossil plants, although imperfectly known, tend to the same conclusion, the cycadiæ constituting the most numerous family."

Here, again, we have abundant unequivocal evidence that this division of the series was deposited in a tropical climate. The most striking points being, that the characters of the deposits, as they follow each other in succession, are like those of the living representatives from the antarctic regions to the tropics, and not in the reverse order. This is a very important fact. The last formation called "tertiary," on the contrary, contains remains more or less identical with the neighbouring seas and lands. The same eminent geologist, in reference to these deposits in southern Europe, states, "In Sicily, Calabria, and in the neighbourhood of Naples, the fossil testacea of the most modern tertiary formations belong almost entirely to species now inhabiting the Mediterranean," &c.; and he very correctly says, that "when any of the fossil shells are identified with living species foreign to the Mediterranean, it is not in the northern ocean, but nearer the tropics that they must be sought," &c.

We find that the ancient philosophers were well acquainted with the mutations going on on the surface of the earth. Pythagoras's doctrine was, that the "solid land has been converted into sea, and the sea has been changed into land," &c. Aristotle's opinion was, that "The distribution of land and sea in particular regions does not endure throughout all time, but it becomes sea in those parts where it was land, and again it becomes land where it was sea; and there is reason for thinking that those changes take place according to a certain system, and within a certain period."†

As geological researches progressed it was found that the changes were not merely those of emersion and submersion of lands, but also that *changes in the geographical position* took place, inasmuch as the fossil tropical remains were found entombed in the northern hemisphere. This additional fact, with the proofs of the changes going on on the surface of the earth, were well known to Dr. Hooke in 1688. His treatise is considered the the most philosophical production of that age, in regard to the causes of former changes, both in the organic and inorganic kingdoms of nature. "Turtles," he says, "and such large ammonites as are found in Portland, seem to have been the productions of hotter countries; and it is necessary to suppose that England once lay under the sea within the torrid zone!" If so, it must have been previous to that in the south temperate zone to receive the Silurian and carboniferous deposits. Indeed, so striking have been the observed changes, as though proceeding from the south, that they have been noticed by all geologists. Kirwan observed, "That in the northern latitudes, beyond 55°, we find the animal spoils of the southern countries, and the marine exuviæ of the southern seas." All these proofs of the occurrence of such changes are now incontestible; but the great difficulty rests on the mode by which to explain their causes.

Sir C. Lyell, in his *Principles of Geology*, has endeavoured to prove that the mere rise and fall of land, and consequent variation in the configuration of the coasts, &c., would be sufficient to account for the vicissitudes in climate. That such effects may, to a certain degree, take place is well known, but it is very difficult to conceive how a torrid heat by such means could be produced in Melville Island or the Arctic regions, for instance. And, again, it must be remembered, that it is not only a question of temperature, but one of peculiar productions. It has been pointed out in a former part of these lectures that the productions of the southern hemisphere are very different to those of the northern, and that such productions depend on some peculiarities connected with the respective zones. Now, when we examine the fossil beds of Europe, we find at the bottom, the southern relics; next, those of the torrid; and, above all, the relics of the north temperature. It therefore follows, that there is a necessity for a movement of the earth's crust, not merely that of rising and sinking, and partial variation of temperature, but also for one from the south towards the north, to account for such fossil productions; and we find the only geologist who appears to have taken this view of the subject, and connected such with both terrestrial and astronomical changes in the degrees, combination and sequence which actually belong to them, according to direct observations, is Mr. Evan Hopkins, in his work on *Geology and Magnetism*, a subject which will be treated on in subsequent lectures.

* *Quarterly Journal Geological Society of London*, vol. ii., p. 37. C. Bunbury, Esq.
† *Meteorics*, chap. 12.

ROCKS AND MINERALS OF NAMAQUALAND—No. IV.

The rocks of the southern part of Namaqualand form in general more bulky mountain masses, and the river (or rather river bed) systems—that is, the radii of the fall of the surface towards the principal rivers—would appear to have a more circular than oblong shape, and the plateaulike mountain basins of the latter shape are disposed with their greatest length more frequently from east to west than from north to south; and although, on comparison of observations made in different localities, a meridional disposition (that is, a meridional direction of their lines of greatest length, and of their main cleavages) of even the more bulky masses of the various kinds of primary (hypogene) rocks is decidedly traceable, still, owing to their greater breadth, and to the considerable variations in their breadth (which apparently depends upon the level on which the rock occurs), that disposition of those rocks in meridional bands is less conspicuous. The meridional main cleavages of those rocks are, in that part of the country, in many spots even less perceptible than east and west cleavages, although I never found the meridional so altogether obliterated as I often noticed to be the case with the east and west cleavages. These bands, or channels of quartz, highly silicious greenstone (near Springbok and Concord, Wheal Maria Mine, &c.), basalt (near Zabisis), soapstone (in the vicinity of Cookfontain), and other rocks, which are produced by a crystalline secretion of minerals from the parent rock, are here oftener noticed to run in an easterly and westerly direction than is the case in Northern Namaqualand, where, with the exception of a few stripes of quartz which are running from east to west, and which invariably dwindle into nothing on either end, I do not recollect having noticed one single instance of any large band or channel of rock ever running from east to west. When in Southern Namaqualand a tendency of the rocks to form east and west fissures (filled with metallic ores, or secretive crystalline rocks) is decidedly traceable, the meridional structure and disposition of the rocks in Northern Namaqualand is so distinctly perceptible that we may follow, especially within the Orange River basin, the run of any single band of rock (say, a talcose or chloritic schist, or quartz rock, &c) for scores of miles, although that band be not broader than about 100 paces. I have often used such bands of rock, for the sake of experiment, as guides, without at all referring to the compass, and they proved in the main as true as the magnetic needle. If we take, near the Orange River, our position, for example, on the top of the "Adam's Peak" (a lofty mass of mountains, crowned by three peaks, of which the middlemost is the highest), on the southernmost extremity of the Kodas basin, or on any other high mountain of that district, we see as far as our eye can reach the whole surface of the country to consist of a number of stripes, of various breadths and colours, all the stripes running parallel to one another, and in a meridional direction, here dipping underneath the sandy soil of a valley and river bed, and being lost to our view, but on the other side of the respective valley, just opposite, invariably coming up again, till, in the dim light of the far distant north or south, all the various stripes appear to melt into one homogenous whole. Most conspicuous amongst those meridional bands of rocks are the dark green bands of hornblendic schists, and the dark brown, almost black bands of a kind of pyritous schist, a rock chiefly composed of quartz, talc, traces of felspar, and lime, throughout the whole mass of which there are sprinkled minute pyrites, which rock, though it has a light greyish colour when fresh broken off, is generally covered with a rather dark and shiny ferruginous crust, that is evidently the result of surface agencies having acted upon and decomposed those pyrites; this pyritous schist (that is, each band of such schist) has an exradiating structure, dipping slightly east on its western edge, slightly west on its eastern edge, its cleavage planes getting vertical towards the middle. All those bands of hornblendic, pyritous, talcose, chloritic, argillacious, and quartzose schists, with their numerous "axes" of milky quartz, bands of granitic rock, and occasionally a dark band of basalt, run invariably in a north and south direction, and generally with a uniform breadth, parallel to each other, a slight difference in breadth between the respective bands being only locally traceable, bands of rocks of an argillacious nature occasionally increasing in breadth towards lower levels (in valleys), and getting thinner towards higher levels (when crossing mountain ridges). The reverse appears to be the case with the channels of reddish and yellowish quartz rock (including the schistose Table Mountain sandstone), which I noticed to expand in breadth when approaching to higher levels, and to decrease in breadth and be interwedged with runs of a light talcose rock, milky quartz, &c., when approaching to and within valleys. Numerous runs of milky quartz are interlaminated between and within those bands of rock; of such milky quartz only I noticed, in Northern Namaqualand, runs which had an easterly and westerly direction, but their breadth was only a few feet, and they partook mostly of the character of floor, their dips deviating only a few degrees from the horizontal; the run of such bands of milky quartz is not continual, but they dwindle often into insignificant strings on either (north or south) end. I did not meet with a single one of those runs of milky quartz within the Orange River district but what contained "erratic" traces of copper ore, consisting in small insignificant fragments of silver grey ore (German "Kupfer Glanz"), or occasionally black ore (German Schwarz Erz), traces of carbonate of copper on the surface and where exposed to the weather, and of silicate of copper. Bands of primary limestone occur also amongst the bands of other rocks (*e.g.*, near Gordon, Orange River; between Oggas and Lekersig; near Kabous Kerk; and to the west of the Kodas basin, &c.), and within such bands there occur seams of beautiful saccharine and white marble (*e.g.*, in the Kabous Valley, Anis Flat). Near to such veins of limestone there are found scattered about on the surface great numbers of flints of various colours, veins of which are noticed to occur within such limestone; I collected specimens, in which, within one specimen, the transition from a white hard limestone into flint is distinctly to be observed. Thin veins of white quartz intersect nearly every one of those various bands of rocks, in almost all directions. All those various bands of rock vary, as already alluded to, in their dips, and the dip of the cleavage planes of a single one of those bands, more especially if that band be of a considerable breadth, shows already some slight variations. A section from west to east, right across all those bands of rock, would represent rocks dipping to the east as well as to the west, and also perfectly vertical cleavage planes, the foliation planes of schistose rocks presenting often (*e.g.*, near Hells Kloof, N'Omies, to the east of Kodas Fountain, &c.) an appearance as if they were exradiating from their base rock underneath, numerous quartz veins being in that case interlaminated between the respective cleavage planes, which, however, appeared in the main to decrease in width downwards, dwindling into numerous small strings that were running in as many various directions as there were cleavages traceable in the respective rock, though they expanded occasionally into larger masses of quartz again, when crossing a horizontal divisional plane that was lined with quartz. A peculiarity in the foliation planes of schistose rocks I noticed in some spots immediately below, and close to, the higher mountain masses which constitute the declivities of the great "steps*" of that table land (in this part of the country always on the western edge). Those foliation planes presented an appearance as if they had been been bent over on their upper part by some lateral pressure; such may be noticed, for example, in the valley of N'Omies (which valley is running from east to west, being a tributary valley to the Kodas basin, which latter stretches from south to north), where we notice, near the upper eastern part of the N'Omies Kloof, a meridional band of a bluish-grey talcose schist, the western foliation planes of which, immediately underneath the soil of the valley, have a western dip; when ascending higher eastward, we notice the dip to be approaching more and more to the vertical, till, still higher up, the foliation planes dip to the east. Pursuing several veins of copper ore which were enclosed in that very rock, we ascertained that this variation of dip was confined only to the surface, the dip at a depth of 20 to 25 ft. changing again into the vertical, and further down into a westerly dip, just as if the rock had been bent over to the westward by the pressure of the weight of the mountain mass on the east, till to such a depth as there was no rock on its west side to counteract that pressure. This bluish-grey schist has perfectly smooth laminæ, but there occur in the same valley, especially on the sides of the mountain ridges, bands of schistose rocks which, in their appearance, bear some resemblance to gneiss, on some spots the stripes of felspar, quartz, and talc (*e.g.*, north of Lettersledt's Lease), or felspar, quartz, and mica (*e.g.*, near N'Omies and Katjesbank), being distinctly perceivable, although the whole mass of the rock is in its structure distinctly schistose, its components being mostly quartz and mica, or talc, with traces of felspar (decomposed), the quartz being mostly disposed within and respectively between the micaceous or talcose laminæ, in the shape of smaller or larger granular nodules, so that the surface of a flake of such a rock, on its lateral fracture, represents a slightly mamillated appearance. Another peculiarity of this "gneissose" schist (if I may be allowed to thus term it) is, that there occur, in addition to those smaller granular fragments, or thin veinlets or strips of quartz, also larger nodules of a highly quartzose nature, their shape bearing, especially near the surface of the rock, some resemblance to that of the quartz pebbles which are noticed to be embedded in the Table Mountain sandstone (see above), but differing in their nature from the Table Mountain sandstone nodules, in so far that they are generally less dense and hard, less purely silicious, and presenting in general a reddish, brownish, or yellowish colour; that we notice on their surface numerous fine fissures, and that we could easily smash them with a hammer, when they would fly into small fragments, such as were indicated by those minute fissures, and each one of those minute fragments would resemble, in size and shape, those minute fragments which are uniformly sprinkled throughout and interlaminated between the whole mass of the rock; and when I have ascribed the most purely silicious nodules of the Table Mountain sandstone to a "silicification" (German, "verkieselung") of the crystals of felspar of the base rock, I should ascribe these nodules, enclosed in that schistose rock, to the circumstance that, wherever such small fragments of quartz come into close contact with one another, and wherever the laminæ of mica or talc that should have been interlaminated between them have been absorbed (by decomposition), those fragments, owing to the impulse of their affinity, would enter into a more intimate connection with one another. I am the more induced to adopt that view as I have frequently noticed that such quartz nodules, especially those of a larger size, did represent on one or more sides often perfectly smooth planes with crystalline angles, although on their remaining sides they had a roundish, worn appearance, their shape being such as if, where such an aggregation of quartz happened to take place in the corner between where two cleavage planes crossed each other, its shape had been modified, its further extension been hemmed in as it were by those cleavage planes, thus causing one or more sides of that aggregation of quartz to assume a shape corresponding to the angle and the direction of those cleavage planes. Where I noticed such to occur, I did not find fragments of quartz of a corresponding shape on the other sides of the respective cleavages, otherwise I should have thought it possible that such nodules of quartz might have existed before, and had subsequently been split into during the creation of the respective cleavages fissures. I was often struck by the singular fact that the direction of greatest length of all such pebbles was uniformly parallel with the direction of the main cleavage fissures of the rock in which they occurred.

JULIUS.

* These steps are not, like the Russian steppes, level plains, but present various shapes of the surface. By steps I mean to designate the general uneven shape of the country as rising from the west towards the interior in several steps, like stair-steps,

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MINERS' SAFETY-LAMP.—We have inspected a very superior description of safety-lamp, the invention of Mr. J. J. Mozard, of Dufour's-place, Golden-square, the chief features in which consist in the wick tube being so connected with the bolt of the lock by which the lamp is kept closed that it is impossible to move the bolt, with a view to open the lamp, without extinguishing the light—the wick and wick tube being drawn entirely within the oil chamber: and a chimney being provided within the gauze, so that the flame cannot be blown or drawn through. Mr. Mozard, in specifying his patent, explains that the upper parts of the lamp are screwed on to the lower part, or oil vessel, in such manner that the parts cannot be unscrewed without acting on the wick of the lamp, and drawing it into the wick tube, so as to extinguish the flame: hence a man using such a lamp cannot obtain a light by opening the lamp. To accomplish this object, there is a trigger, or lever, which is acted on several times by projections, or catches, in the act of unscrewing the parts. This trigger, or lever, gives motion to a claw, which each time it is moved enters the wick, and causes it to be drawn down a distance into the wick tube, and the wick is prevented from rising by its elasticity, or otherwise, by spring points, which retain the wick down to the position it may be brought by the claw. In order to prevent the flame being blown or drawn through the wire gauze, a chimney is used, which ascends to such a height as to prevent the flame being acted on. The wire gauze is closed at top, and also at the bottom, except where the chimney passes into it. Above the upper part of the oil vessel, and below the wire gauze, the flame is protected by a cylinder of thick glass. The wick is snuffed by the ordinary bent wire. In a miner's lamp arranged according to this invention, the gauze shade and parts connected therewith cannot be removed from the lamp without drawing the wick into the wick tube, and extinguishing the flame; there is an oil vessel, on the top of which is formed the screw for receiving the ring to which the shade of the lamp is attached. A spring catch, or trigger, projects up through a slot in the top of the oil vessel, and is curved at the end of the wire, which slides through a hole in the support, and has coiled round it the spiral spring. The end of the wire is bent up, and acts on the arm at the end of the axis, which is supported by projections, from the top of the oil vessel, and has coiled round its further end the spring. There is a claw fixed on the axis, acting so as to draw the wick into the wick tube when the ring is unscrewed. The snuffing wire is of the ordinary kind. The action of the apparatus is, on the under side of the ring are three or more projections, which when the ring is screwed on pass over the catch, for the inclined sides of the said projections come in contact with the inclined side of the catch, so as to press it down, and it is permitted to descend by the yielding of the supporting spring, but when the ring is unscrewed the straight sides of the projections come in contact with the straight side of the catch, which is thus drawn forward until its inclined end comes in contact with the end of the slot, and during this motion the end of the wire acts on the arm on the axis, which is thus caused to make a partial revolution, and the claw enters the wick, and draws it partially and completely into the wick tube. As the unscrewing of the ring is continued the catch descends, and is then brought back by the spring to its starting point; at the same time the claw is brought back by the spring, and to the wick rising with the claw spring points may be used, but this the inventor does not find essential in practice. When by further unscrewing the ring another projection is brought up to the catch, the operation is repeated, and so on until the light is extinguished. In a modification of the invention the lamp is also arranged so that the gauze shade and the parts connected therewith cannot be unscrewed without drawing the wick into the wick tube, and extinguishing the flame; but it differs somewhat in its details from the lamp already described. The oil vessel is formed for receiving the ring, as before, but there is also an horizontal axis, supported at one end by the projection from the bottom of the oil vessel, and passing out through the side of the oil vessel through a piece of leather, to make a tight joint. On the end of the axis a short tube is fixed, into which the stem of the key just fits, and the side of this tube is notched to receive the projecting part of the key: this key acts to depress the spring catch, and until this catch is depressed by turning the key the ring cannot be unscrewed, for it has projections on its under side, as in the lamp already described; but by turning the key to depress the catch, motion is given to the axis, and so to the claw, which draws the wick into the wick tube, and extinguishes the light. The inventor claims, first, the so arranging a miner's lamp that the gauze shade cannot be removed without extinguishing the flame: and, second, the arrangement of the metal chimney, and the cylinder of wire gauze closed at the top and bottom, as described. The lamp, which is stated to give the light of six candles, can be supplied for about 10s.; and with a view to promote the adoption of a means of lessening the loss of life from causes which would be prevented by the use of an efficient safety-lamp, we shall have a model lamp at our office, for the inspection of those interested, and will undertake to receive orders from those desirous of adopting the invention.

MANUFACTURE OF COAL OILS.—It appears that this manufacture is now about to be developed in the United States to an extent to which its importance entitles it. We learn from Hunt's *Merchant's Magazine*, that the Breckenbridge Coal Company have offered to supply the Lighthouse Board with 95,000 gallons of oil, as a supply for the coming year. They offer it at a lower price than the best sperm, and guarantee the same excellent properties. The board never having used such oil for illumination, very prudently ordered a test of its qualities before making a contract. If the result proves satisfactory, the contract will no doubt be made. The supply of all kinds of oil does not appear sufficient for the increased demand, as the price has been steadily advancing during the past ten years. On the Ohio River, Kentucky, are extensive works, running 12 retorts night and day, consuming from 8 to 10 tons of coal every 24 hours, and producing 750 gallons of crude oil. Re-distilled, this quantity yields 125 gallons of benzole, 75 of naphtha, 225 of lubricating oil, and 175 of oil for illuminating purposes.

HYDRO-STEAM ENGINES.—A large silk manufactory is being constructed in Newark, to be driven by a water-wheel, the water for which is pumped in a continuous circuit by steam. The pressure maintained on the jet of water is very great, and the wheel is a small and exceedingly well finished turbine, the diameter of which is only about 1 foot. The revolutions are consequently so rapid, that instead of multiplying the speed in transmitting it to the shafting, as is usually necessary with all machinery of this description, whether impelled by water or steam-power, it has in this case actually to be reduced. It is claimed by the inventor, Mr. Wm. Baxter, that the simplicity and economy of the steam pumping machinery employed, is such as to more than balance the waste in transmitting the power through the water-wheel, and that, consequently, the power is produced and given off to the machinery at a less cost for fuel, and with less wear and tear of the machinery, as well as also more steadily, than in the ordinary steam engines.—*Scientific American*.

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NEW PATENT ACT, 1852.—Mr. CAMPIN, having advocated Patent Law Reform before the Government and Legislature, and in the pages of the *Mining Journal*, &c., is now READY to ADVISE and ASSIST INVENTORS in OBTAINING PATENTS, &c., under the NEW ACT.
The Circular of Information, gratis, on application to the Patent Office and Designs' Registry, 156, Strand.

THE ENGINEER of Friday, 17th of April, contains descriptions of Monckton and Clark's Machinery for Tilling Land, Fletcher's Weighing Cranes, Dumery's Improvements in Steam Engines, Moberly's Improvements in Grinding and Polishing Surfaces, Jobard's Improvements in Lamps, Newton's Machinery for Cutting Round Files, also for Combing Fibrous Substances, New Charger for Shot Pouches, all illustrated. Original Articles on Colliery Explosions, Re-patenting Old Inventions, Growth of Cotton in India, Farm Labourers of the Midland Counties, April Showers. Abstracts of Papers on the Permanent Way of the Bordeaux and Bayonne Railway, by Mr. Conder; also on Houses as they Were, Are, and Ought to Be, by Mr. Papworth; conclusion of Paper on the Application of Sewage to Agriculture, by Mr. Dugald Campbell. The Rent Crisis in Paris, Iron Smelting in Australia, the Great Comet, Correspondence concerning the Tyne Steamer, Adulteration of Bread, &c. &c., Patent Journal; Timber and Metal Markets; Trades of Birmingham, Wolverhampton, and other Districts; and all the Engineering News of the Week. 24 pages, Price 6d.; Stamped, 7d.—BERNARD LUXTON, Publisher, 301, Strand.

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STONYWAY MINES, MATLOCK, DERBYSHIRE.—The proprietor of the veins comprising the Stonyway title has been for several years past adopting the necessary means to open the ground for more extensive operations, being fully convinced that his efforts would meet with ample returns, and he has now the satisfaction of bringing these mines to the notice of the public as a safe means of investment. The old Stonyway engine-shaft, which is close to the river, was formerly worked by means of horse-power, in drawing water from a depth of about 28 yards below the level of the river; this was done before the present improved methods of working our mines were brought into operation, and from the evidence of old men, and the Barmasters' books, the Stonyway vein was then yielding profitable returns. This was the first inducement to the present proprietor of turning his attention to other means of overcoming the partially watered state of the mine, and instead of operating upon the old workings of Stonyway, he has sunk upon an intersecting cross vein, called Jane vein, to a depth of 15 ft. below the level of the river, where he has met with very strong ore, and, as will be seen from the returns of 63 shifts only, including the expensive operation of drawing top water, that a handsome profit has been made. And it is to be borne in mind, that, inasmuch as the new discovery is not yet out of the chert measures, the riches of the vein may be very much increased on cutting the white stone and its bearing clays, which it is well known are the guiding features for mineral trial in this district; it is also a favourable circumstance that the chert beds have gone below the natural water level, as from their closeness will at all times keep the mine from being heavily watered. A few feet lower will cut into the white stone measures, but until less expensive means are adopted, and consequently greater facility given to future operations, the proprietor has come to the determination of putting the mine into the hands of other shareholders along with himself, so as more effectually to carry out the operations he first set out with. He has expended £200 in taking up ground, ripping engine-shaft on Jane vein, building coes, erecting drawing gin, driving south from shaft (where the present work of ore has been discovered), the purchasing of a 16-horse cylinder and working gear, which is ready for putting into work, and in the other general plant necessary to carry on the mine. He has been assisted by a thoroughly practical engineer as to the cost of bringing the mine into an efficient state for work, and he is fully assured by such consultation, and his own judgment, that £1000 will be amply sufficient to put down the engine already purchased, and pay the present outlay and value of the mines. It is, therefore, proposed, first to liquidate the cost and the value set upon the mines (viz., £400), the present proprietor taking 100 out of 1000 shares of £1 each, leaving £600 to be expended in th further development of this desirable trial.
A specimen of the ore may be seen at the mine; and a plan of the ground may be seen at Mr. CHARLES WALKER'S, in Matlock, to whom application for shares may be made, and from whom every satisfactory information may be obtained, as to the present state of the workings.—Matlock, March 1, 1857.

At a PRELIMINARY MEETING of the shareholders of this undertaking, held at the Wheat Sheaf, in Matlock, on the 12th ult., for the purpose of registering shares and for general purposes, it was deemed advisable that the season of the year should be taken advantage of for immediate operations in putting down machinery, and sinking the old Stonyway engine-shaft to the required depth. It is also desirable that the unallotted shares should be registered, an early application for which is requested to be made to Mr. J. WHEATCROFT, C.E., the secretary to the company.
Matlock, March 28, 1857.

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